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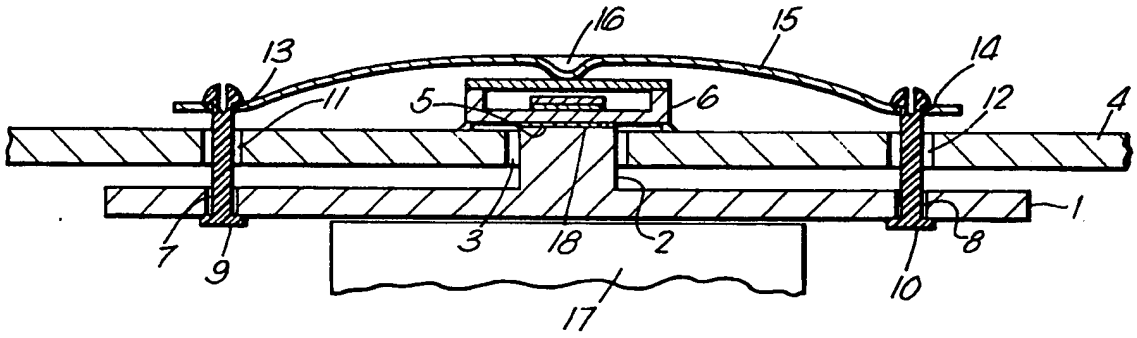
(54) Heat sink

(57) A thermally conductive member (1) has a projection (2) passing through an aperture (3) in a circuit board (4) to engage a heat sinking surface of a component such as an integrated circuit package (6). A self aligning securement for the member is provided by an elongate spring member (15) bearing on the opposite face of the component and secured to the member (1) by pins (7,8) passing freely through apertures (11,12) in the board. For heat sinking of the upper surface, the positions of the two members (1,15) may be reversed, the spring member 15 having a projection extending through the aperture (3).

Fig . 1.



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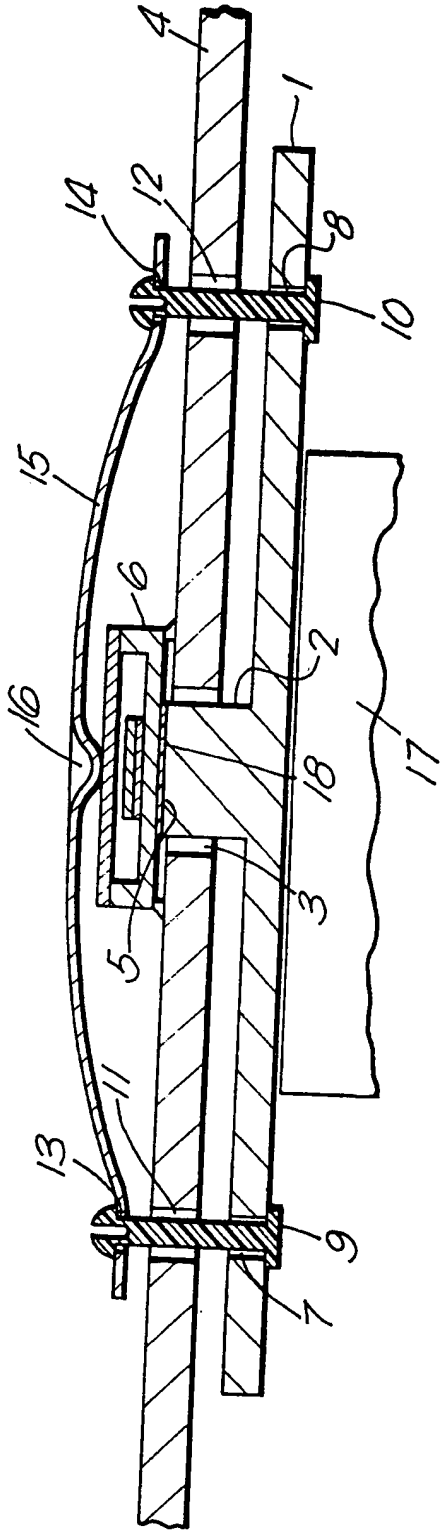

Fig. 1.

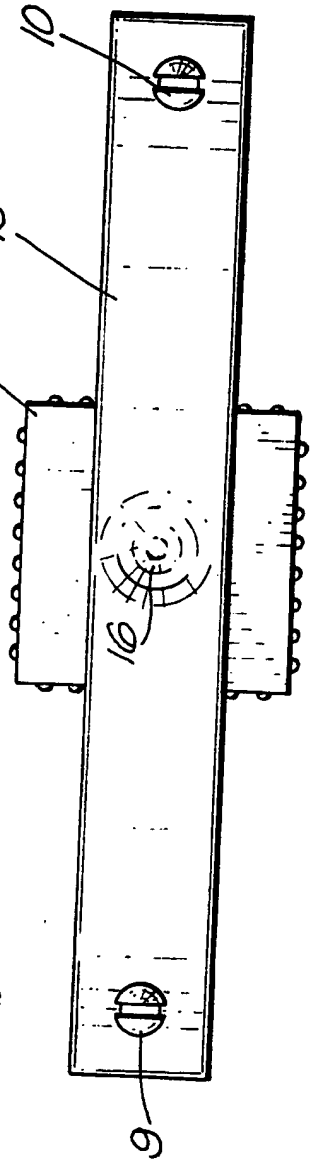

Fig. 2.

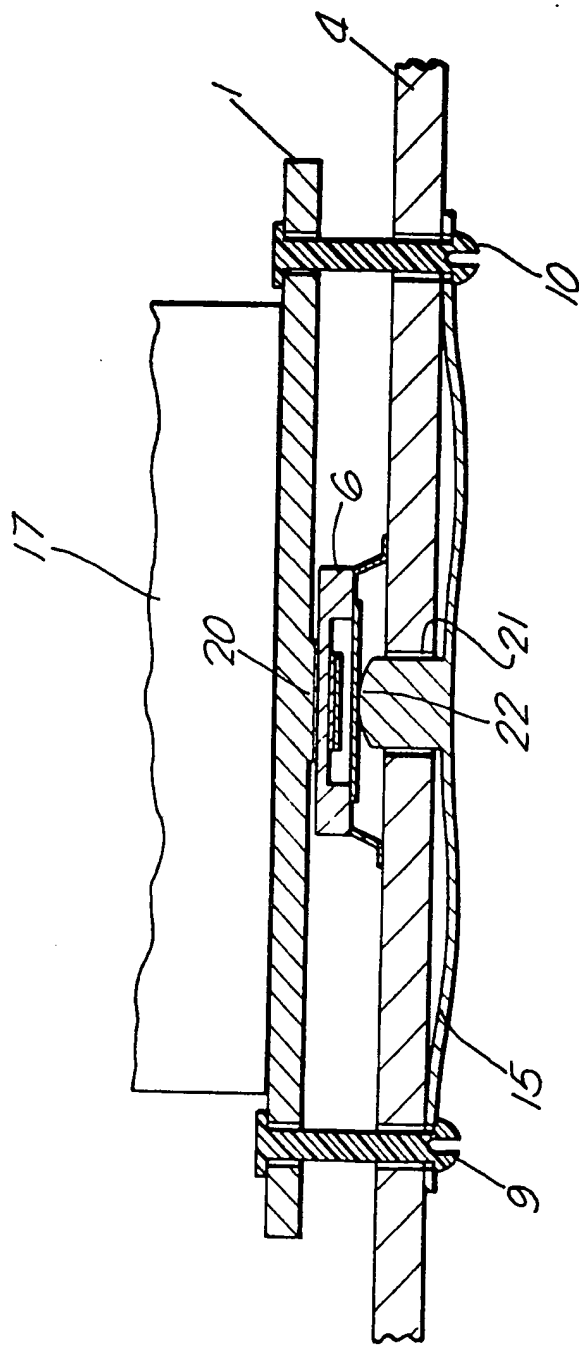

Fig. 3.

SPECIFICATION

Heat sink

The present invention relates to heat sinks and more particularly to heat sinks for use with electronic components such as integrated circuits.

With the increasing use of smaller integrated circuit packages, with highspeed circuitry, larger scale integration and hence substantial heat dissipation in a small area, heat sinking is becoming of increasing importance. In particular, there is the need to maintain good contact between the heat sink and the underside (assuming conventional chip location within the package) of the package, avoiding air gaps. With chip location on the upper surface, or with other components, the heat sink may be above, of course.

The present invention aims to provide a satisfactory heat sink for such applications, taking into account the possibility that the components may not be aligned precisely parallel to the plane of the printed circuit board (or other substrate) on which they are mounted.

The invention finds particular application in situations where only one or a few of the chip packages on a circuit board have substantial heat dissipation. The invention enables them to have efficient individual heat sinking, with only minimal extra board space being needed for the securing pins. Indeed in some cases it may be possible to add such heat sinks to existing circuit boards or at least existing designs of circuit boards in order to provide improved cooling for 'hot' chip packages.

According to the present invention, there is provided a heat sink for an electronic component, comprising a thermally conductive member having a projection for extending, in use, through an aperture in a substrate upon which the component is mounted, the projection having a contact face for thermal contact with the underside of the component, an elongate spring member having a central portion to bear on the upper surface of the component, and securing pins which can, in use, pass through apertures in the substrate, engaging with the spring member and the thermally conductive member so as to resiliently urge the contact face into contact with the component.

The invention is especially, though not exclusively, useful for surface-mounted integrated circuit packages (e.g. chip carriers).

An alternative configuration is proposed where contact is required to the upper surface of the component and thus the invention provides, in another aspect, a heat sink for an electronic component, comprising a thermally conductive member having a contact face for thermal contact with the upper face of the component, an elongate spring member having a central projection for extending, in use, through an aperture in a substrate upon which the component is mounted, the projection bearing on the underside of the component, and securing pins which can, in use, pass through apertures in the substrate, engaging with the spring member and the thermally conductive member so as to resiliently urge the contact face into contact with the component.

One embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figures 1 and 2 are respectively a cross-section and plan view of one form of heat sink according to the present invention; and

Figure 3 is a cross-section of an alternative version.

Referring to Fig. 1, the thermally conductive member is in the form of a flat plate 1 of suitable conductive material such as aluminium. Integrally formed in it is a projection or stud 2 which passes through an aperture 3 in a circuit board 4 so that the flat upper face 5 engages the lower, heat sinking, face of an integrated circuit package 6. A thermally conductive compound 18 (loaded grease or an elastomer) may be provided between the surface 5 and the i.c. package, as is normal practice when fitting heat sinks. The plate 1 has apertures 7, 8 through which pass pins 9, 10—e.g. of plastics material. These pass through apertures 11, 12 to engage in apertures 13, 14 formed in the ends of an elongate spring steel leaf 15; the ends of the pins being formed, as shown, for snap-in engagement with the apertures 13, 14. The leaf 15 has a convex central portion or "domed" indentation 16 to provide contact with the upper surface of the integrated circuit package 6, centrally with respect to the projection 2, thus permitting the spring to rock in any direction for alignment. If it is inconvenient to form the spring in this way, a separate rounded piece could be attached (cf Fig. 3).

The length of the pins 9, 10 is such that the spring steel leaf is held in a compressed state so that the contact surface 5 of the projection 2 is urged into good thermal contact with the underside of the package 6. The apertures 3, 11 and 12 in the circuit board 4 are arranged, as can be seen, to provide adequate clearance such that the heat sink, pin and spring assembly can assume a position deviating from a plane parallel to the circuit board, so that good contact is maintained despite possible misalignment of the chip package 6. Moreover, excessive stresses on the soldered joints and circuit board are avoided since the heat sink may be tightly clamped to the component whilst effectively "floating" with respect to the circuit board.

Optionally, a larger heat-sinking member 17 may be in thermal contact with the plate 1.

Fig. 3 shows an alternative arrangement, for

heat sinking the top surface of a component. The plate 1 has a slightly raised flat contact face 20 to engage a heat sinking surface of a component 6; whilst the spring 15 has secured to it a projection 21 with a domed face 22 analogous to the indentation 16 of the first version. Otherwise the construction is as in Fig. 1.

CLAIMS

1. A heat sink for an electronic component, comprising a thermally conductive member (1) having a projection (2) for extending, in use, through an aperture (3) in a substrate (4) upon which the component is mounted, the projection having a contact face (5) for thermal contact with the underside of the component (6), an elongate spring member (15) having a central portion (16) to bear on the upper surface of the component, and securing pins (9, 10) which can, in use, pass through apertures (11, 12) in the substrate, engaging with the spring member (15) and the thermally conductive member (1) so as to resiliently urge the contact face into contact with the component.

2. A heat sink for an electronic component, comprising a thermally conductive member (1) having a contact face (5) for thermal contact with the upper face of the component (6), an elongate spring member (15) having a central projection (20) for extending, in use, through an aperture (3) in a substrate (4) upon which the component is mounted, the projection bearing on the underside of the component, and securing pins (9, 10) which can, in use, pass through apertures (11, 12) in the substrate, engaging with the spring member (15) and the thermally conductive member (1) so as to resiliently urge the contact face into contact with the component.

3. A heat sink according to claim 1 or 2 in which the pins are arranged for snap-in engagement with apertures in the thermally conductive member or the spring member.

4. A heat sink substantially as hereinbefore described with reference to and as illustrated in Fig. 1 of the accompanying drawings.

5. A heat sink substantially as hereinbefore described with reference to and as illustrated in Fig. 3 of the accompanying drawings.

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